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The Food of Malabar Pied Hornbill

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Abstract

Food of Hornbills

Visual observations were made to find out the types of food of Malabar pied hornbill *Anthracoceros coronatus*. Lipids, proteins and carbohydrates were determined for different fruits. The hornbills were observed feeding on the fruits of 17 different food plants and eight animal food items. The food consumption was understood on the basis of the food consumed per feeding bout. Hornbills are very fond of *Ficus* and *Strychnos* fruits. These birds preferred to feed on the succulent fruits which obviate the need of water. Consumption of fruits is related to the size, weight and its nutritional value. All the types of fruits are found equally effective in contributing the essential nutrients.

Introduction

Hornbills (*Aves : Bucerotidae*) are inhabitants of the tropics and distributed in Ethiopian, Oriental and Australasian region of the World. According to Kemp (1976) 11 out of 14 genera of hornbills (28 of the 45 species) are mainly frugivorous and the remaining three are mainly insectivorous. These birds inhabit all types of the tropical forest. Population of hornbills is fast dwindling due to indiscriminate deforestation which leads to the scarcity of food and suitable nesting trees and roosting places. According to Kemp (1973) the food supply is one of the main proximate factors to trigger breeding in hornbills. After making detailed studies, Kemp (1976) emphasised the importance of food particularly during the breeding period of hornbills and came to the conclusion that the food supply determines clutch size, duration and timing of egg laying. The reports of Stonor (1937), Moreau and Moreau (1941), Kilham (1956) in *Bycanistes* hornbills regarding the inadequate food supply are so alarming in the sense that it affects the breeding so much that the females come out of the nest without laying eggs.

The literature on hornbills lists the food items of about 20 out of 45 species. Detailed information on the food of very few species of hornbills is available. Some information is available from the field studies on the Casqued hornbill *Bycanistes subcylindricus* (Kilham, 1956), Monteiro's hornbill *Tockus monteiri* (Kemp and Kemp, 1972), eight species of the hornbills of Sarawak (Kemp and Kemp, 1974), three species of *Tockus* hornbills of Africa (Kemp, 1976), Ground hornbills *Bucorvus* and *Sagittarius* (Kemp and Kemp, 1978), Great pied hornbills *Buceros bicornis*, Indian pied hornbill *Anthracoceros albirostris*, Wreathed hornbill *Rhyticeros undulatus*. Brown hornbill *Ptilolaemus tickelli* of Thailand (Poonswad et al., 1983) and Malabar grey hornbill *Tockus griseus griseus* (Basalingappa *et al.*, unpublished). Records are available for a very few feeding incidences of Ground hornbill *Bucorvus* species (Pitman, 1928), Common grey hornbill *Tockus birostris* (Lowther, 1942) and most of the hornbills of the Indian sub-continent (Ali and Ripley, 1983). Primrose (1921) for Indo-Burmese pied hornbill *Anthracoceros albirostris*, Abdulali (1951) for Malabar grey hornbill *Tockus griseus griseus* and Hutchins (1976) for *Anthracoceros malabaricus malabaricus* have reported the food of the different species of hornbills

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maintained under captivity. Very few feeding incidences are reported by Ali and Ripley (1983). Except Basalingappa *et al.* (unpublished) on *Tockus griseus griseus* no detailed study has been made on the hornbills of the Indian sub-continent.

In the present investigation attempts are made to enumerate food, food preference and the consumption of different food items. The nutrients such as lipids, proteins and carbohydrates of different food items have also been analysed.

Materials and Methods

The observations were made on the food and food consumption of hornbills *A. coronatus* at Dandeli (15° 18' N, 74° 37' E) forest in North Kanara District of Western Ghats in Karnataka (India). The hornbills *A. coronatus* during their forage were closely followed to manifest the different food plants on which they regularly feed. Consumption of different food items including the animal food per feeding bout was understood by observing through 7 x 50 field binoculars.

We collected ripe fruits from different fruit plants on which the hornbills regularly feed, brought them to the laboratory, weighed and determined their average weight and diameter. We estimated the food consumption of hornbills on the basis of the fruits consumed per feeding bout.

The percentage of water was determined by drying the fruits in hot air oven to constant weight at 90°C. Total lipids, proteins and carbohydrates of different fruits which formed the food of hornbills were estimated and recorded. Total lipid from a known quantity of dried fruit sample was extracted with the mixture of chloroform methanol in a ratio of 2 : 1 (v/v) following the method of Folch *et al.* (1957). Further, the extract was estimated by semi-micro method of Pande et al. (1963). Total protein was estimated on wet weight basis according to the Folin-Ciocalteu method of Lowry *et al.* (1951). Total carbohydrates were estimated on wet weight basis following the Phenol-Sulphuric acid reaction method of Dubois *et al.* (1956). The above estimations were repeated twice with three sets and calculated the percentage of total lipid, protein and carbohydrate using the average values.

For analysing the data and the food values, two-way analysis of variance with one missing value followed by the Student-Newman-Keuls multiple comparison test was conducted. The significance test at 5% level is chosen for the analyses.

Results and Discussion

Malabar pied hornbills *A. coronatus* feed mainly on fruits. The hornbills were also found taking to animal food whenever there was the seasonal paucity of plant food. The list of the fruits on which the hornbills feed is presented in Table 1. It is interesting that the hornbills were found feeding on a variety of fruits belonging to 17 different plant species and eight types of animal food. The hornbills were also found feeding on the leaves of *Melia composita.*

Regarding the animal food, hornbills were found feeding more on smaller insects such as termites than larger prey like lizards. The larger hornbills of Africa-*Bucorvus* and *Sagittarius* even feed on large prey such as mongoose, polecat and hares (Kemp and Kemp, 1978); and most of the large hornbills of Oriental region feed on fishes, lizards, snakes, tree frogs, nestling birds and cave swifts (Kemp and Kemp, 1974; Ali and Ripley, 1983; Tikadar, 1983). The hornbills were also observed meticulously pecking the covered runways of termites and feeding on them with the tip of their huge beak. Thus, the diet of hornbills *A. coronatus* includes 68% plant food (fruits) and 32% animal food. Of the plant food, fig fruits contribute 20% and the remaining 48% includes non-fig fruits. These birds are very fond of *Ficus* (Ali and Ripley, 1983) and *Strychnos* fruits (Gamble, 1972). The present observations also revealed that *Ficus* and *Strychnos* fruits are eaten commonly. The pulp of the Strychnos fruit though poisonous is eaten by these hornbills (Gamble, 1972). The fruits of *Strychnos* contained two major alkaloids Strychnine and Brucine (Chakravarti, 1976). It was observed that the hornbills fed on such poisonous fruits voraciously and with much liking. How exactly the alkaloids are detoxified by these hornbills is a matter to be investigated. According to the forest officials of Kanara Circle, these hornbills were visiting the agricultural fields in the plains of Malannad adjacent to the forest and found feeding on ripe chillies.

Thus, the hornbills *A. coronatus* appear to be more frugivorous than carnivorous. Poonswad *et al.* (1983) while studying the other hornbills of the Oriental region held a similar opinion. During three years of study, the Malabar pied hornbills were never observed drinking water. There are no reports on record regarding any of the hornbill species drinking water.

The wet weight of the fruits, number of fruits consumed and food consumption per feeding bout are given in Table 2. It was not possible to record food consumption for different fruits except *Machilus macrantha*, because of the mixing up of the birds in a flock during their forage. It was, however, possible to observe and record the food consumption of a female hornbill which was recognised by its broken casque in

a flock. During two days of observation, the birds confined their feeding mainly to the fruits of *Machilus macrantha* tree situated at the Experimental Plot, at Dandeli Timber Depot. A female hornbill consumed an average of 165.5 fruits of *Machilus macrantha* and 4.5 items of animal food per day (Table 3).

Table 2 illustrates average wet weight, maximum fruits consumed and food consumption per feeding bout of the hornbills. These birds consumed a minimum of five fruits of larger size (*Strychnos nux-vomica*) and maximum of 79 fruits of smaller size (*Grewia tiliifolia*). Consumption of fruits was dependent on the size, weight and the nutritional value. The weight of the fruits consumed by these hornbills varied from 5.74 g to 117.72 g per bout. Among the fruits consumed, the maximum quantity of 117.71 g per bout was of *Ficus glomerata* followed by *Strychnos nux-vomica* (102.12 g per bout) and *Machilus macrantha* (98.28 g per bout). The birds were very fond of *Ficus* fruits which they ate voraciously. The fruits of *Melia composita, Polyalthia longifolia, Caryota urens* and *Mallotus philippensis* were consumed in lesser quantities than those of Ficus, may be for they had larger seeds. Most of the fruits contain high percent of water. Hence the hornbills were not found to drink water. The hornbills were also found feeding on the placenta from the fruits of *Swietenia mahogoni*. Feeding on such a dry placenta of fruits though with meager content of lipid and protein might be for supplementing their food with high content of carbohydrate as the fruits of *Swietenia mahogoni* contain higher carbohydrate (9.38%). Thus the hornbills feed on a variety of fruits. But the analysis of variance test for the food items revealed insignificance for differential preference, implying all the food items are equally effective in contributing the nutrients.

Table 4 illustrates the values of total lipid, protein and carbohydrate of some of the fruits which formed the food of *A. coronatus*. Though the hornbills feed voraciously on the fruits of *Ficus* spp, *Strychnos nux-vomica, Caryota urens, Grewia tiliifolia, Polyalthia fragrans*, the multiple comparison test showed that all the food items have the same mean effect and they equally contribute the nutrients in the diet of hornbills.

Summary

Hornbills inhabit mainly tropical forests of Ethiopian, Oriental and Australasian regions of the world. Most of the hornbills live on plant food. Their population is fast dwindling due to indiscriminate cutting of forest which leads to scarcity of food, suitable nesting trees and roosting places and even affecting their breeding success. Information on the food of hornbills is meager except the record of very few feeding incidences. Visual observations were made to enumerate the food of hornbills. The food preference and consumption of different food items were observed. The percentage of water, lipids, proteins and carbohydrates from the fruits on which hornbills regularly feed was determined. The hornbills are mainly frugivorous and less carnivorous. These birds were found feeding on the fruits of 17 different plant species and 8 types of animal food. Hornbills are very fond of *Ficus* and *Strychnos* fruits. During three years of study, the hornbills were never observed to drink water. These hornbills consume a minimum of five fruits of larger size and a maximum of 79 fruits of smaller size. Their consumption of fruits depends upon the size, weight and nutritional value but, all food items have a high percentage of water. Results of the nutritional value tests show that all food items have the same mean effect and they contribute the nutrients equally in the diet of hornbills.

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Table 1. List of the food items (fruits and animals) recorded as the diet of the hornbill *Anthracoceros coronatus* during the field study.

A. PLANT FOOD (FRUITS)	B. ANIMAL FOOD
Grewia tiliifolia	Terrestrial Snails
Mallotus philippensis	Beetles
Ficus infectoria	Lepidopteran larvae
F. glomerata	Grass-hoppers
F. religiosa	Cicadas
F. bengalensis	*Mobuya sp.*
F. rumphii	*Calotes versicolor*
Strychnos nux-vomica	Termites
Polyalthia fragrans	
P. longifolia	
Schleichera oleosa	
Machilus macrantha	
Caryota urens	
Melia composita (fruits and leaves)	
Swietenia mahagoni (plancenta of fruits)	
Syzygium cuminii	
Buchnania sp.	

Table 2. Average wet weight of food items (fruits), maximum number of fruits consumed and food consumption per feeding bout of the hornbill *A. coronatus*.

Food items	Average diameter (cm)	Average wet weight gm	Maximum fruits consumed per bout	Maximum food consumption g/bout
Grewia tiliifolia	0.87	0.50	79	39.50
Mallotus philippensis	0.96	0.33	22	7.26
Ficus infectoria	2.65	8.98	9	80.73
F. glomerata	2.89	9.81	12	117.72
F. religiosa	1.19	0.63	71	44.73
F. bengalensis	1.97	3.00	12	36.00
Strychnos nux-vomica	5.15	47.48 (20.43)*	5	102.12
Polyalthia fragrans	2.17	9.88	7	69.16
P. longifolia	1.85	4.44	13	57.72
Schleichera oleosa	1.83	3.45	11	37.95
Machilus macrantha	1.75	2.52	39	98.28
Caryota urens	1.96	3.54	8	28.32
Melia composita	2.43	Part of the fruit was eaten		
Swietenia mahagoni (Placenta only)	–	11.48	1/2	5.74
Syzygium cuminii	1.98	4.62	9	41.58

* Wet weight of only pulp and seeds.

Table 3. Food consumption of a female hornbill *A. coronatus*.

Date of Observations	Total hours of Observations	Number of food items consumed	
		Plant food	Animal food
12.2.1985	11	153	5
13.2.1995	11	178	4
Average	11	165.5	4.5

Table 4. Nutritional composition of the fruits which formed the food items of hornbill *A. coronatus*.

Food items (fruits)	Percent water	Percent lipid (Dry wt)	Percent protein (Wet wt)	Percent carbohydrate (Wet wt)
Grewia tiliifolia	65.88*a	3.05b	1.74b	6.82b
Mallotus philippensis	22.26	8.75	6.53	3.38
Ficus infectoria	82.20	4.17	4.15	5.77
F. glomerata	86.20	3.28	2.60	6.00
F. religiosa	74.33	3.89	2.90	9.50
F. bengalensis	72.90	3.08	4.10	5.50
Strychnos nux-vomica	79.86	7.58	2.82	25.44
Polyalthia fragrans	78.93	19.61	2.86	8.75
P. longifolia	78.85	9.20	3.26	6.94
Schlichera oleosa	81.76	3.13	5.38	1.43
Machilus macrantha	73.53	30.07	2.23	2.08
Caryota urens	70.06	2.70	3.80	11.82
Melia composita	69.73	4.99	3.32	21.43
Swietenia mahagoni	7.00	0.98	1.92	9.38
Syzygium cuminii	83.70	0.30	0.70	14.00

* Calculated missing value.

Analysis of variance : Food contents $F_{3,41}=91.59$, $P<0.05$
Food items $F_{14,41}=1.04$, $P>0.05$

S.N.K. test for food contents : The columns followed by the same letter are not significantly different from each other at $P<0.05$ level.